INTERNATIONAL BUREAU OF WIPO

In re Application of	)	VESUVIUS CRUCUBLE COMPANY
Title	)	Gas Purged Nozzle
Int'l Application Number	)	PCT/US03/27209
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Examiner	)	Maria Van der Hoeven
Attorney Docket No.	)	1370 PCT

AMENDMENT TO THE CLAIMS UNDER ARTICLE 19

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011-41-22-740-14-35

In response to the PCT International Search Report mailed 14 January 2004, please amend the claims as follows.

1. A refractory nozzle for use in the casting of molten metal having an inlet, an outlet fluidly connected to the inlet, an outer surface, an inner surface defining a bore between the inlet and the outlet, and a top surface surrounding the inlet, the nozzle adapted to receive a flow of inert gas and characterized by:

   a) a ~~substantially~~ gas-impervious refractory composition lining substantially the entire ~~at least a portion of the~~ inner surface; and

   b) a gas-permeable refractory composition surrounding at least a portion of the gas-impervious composition, the permeable composition having a porosity sufficient to permit diffusion of inert gas.

~~12~~13. The refractory nozzle of any one of the preceding claims, further characterized by a metal housing at least partially encasing the outer surface of the nozzle.

~~13~~.14. The refractory nozzle of any one of the preceding claims, further characterized by the permeable composition extending to the top surface, whereby inert gas

can purge the molten metal when pressure of the inert gas exceeds ferrostatic head in the molten metal.

STATEMENT

Applicant has amended the claims to correct typographical errors and to clarify the distinction between the present invention and the prior art.

As amended, the nozzle comprises a gas permeable composition surrounding at least a portion of a gas-impervious composition, which makes up an inner surface of the nozzle. In contrast, the cited prior art teaches an impermeable liner over only a fraction of the inner surface.

The nozzle of the present invention comprises a gas-impervious composition that defines a bore through which the molten metal may flow. This configuration simultaneously shrouds the nozzle with inert gas and shields the molten metal from gas of any type. Prior art does not teach or suggest this feature of the invention.

Prior art directs gas into the molten metal at defined locations along the nozzle. For example, US 5723055 and JP 61-020660 direct gas to the top of the nozzle. US 4778775 teaches injecting gas into the lower portion of a nozzle. These references do not attempt to shield the molten metal from gas.

Applicant respectfully requests substitution of the amended sheets for the corresponding sheets in the present application, and requests the written opinion be based on the amended claims.

Date: 3 Feb 2004

Respectfully submitted,

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AMENDED SHEET

WHAT IS CLAIMED IS:

1. A refractory nozzle for use in the casting of molten metal having an inlet, an outlet fluidly connected to the inlet, an outer surface, an inner surface defining a bore between the inlet and the outlet, and a top surface surrounding the inlet, the nozzle adapted to receive a flow of inert gas and characterized by:
   a) a gas-impervious refractory composition lining substantially the entire inner surface; and
   b) a gas-permeable refractory composition surrounding at least a portion of the gas-impervious composition, the permeable composition having a porosity sufficient to permit diffusion of inert gas.
2. The refractory nozzle of claim 1, further characterized by the gas-permeable composition having a porosity of at least 15%.
3. The refractory nozzle of any one of the preceding claims, further characterized by the permeable composition including an open-cell pore structure and an average pore size of at least one micron.
4. The refractory nozzle of any one of the preceding claims, further characterized by the permeable refractory composition selected from the group consisting of carbon-bonded refractories, oxide-bonded refractories, resin-bonded refractories, castable refractories and mixtures thereof.
5. The refractory nozzle of any one of the preceding claims, further characterized by the gas-impervious refractory composition selected from the group consisting of carbon-bonded refractories, oxide-bonded refractories, resin-bonded refractories, castable refractories and mixtures thereof.
6. The refractory nozzle of any one of the preceding claims, further characterized by the gas-impervious composition including oxygen getters.

7. The refractory nozzle any one of the preceding claims, further characterized by the gas-impervious composition comprising a resin-bonded refractory comprising 50-90 wt.% refractory aggregate, 1-10 wt.% binder, and 0.5-15 wt.% reactive metal.

8. The refractory article of claim 7, further characterized by the refractory aggregate comprising at least one refractory material selected from the group consisting of alumina, zirconia, calcia, magnesia, silica, and mixtures and compounds thereof.

9. The refractory nozzle of any one of claims 7 and 8, characterized by the reactive metal comprising at least one metal selected from the group consisting of aluminum, magnesium, silicon, titanium, and mixtures and alloys thereof.

10. The refractory article of any one of the preceding claims, characterized by the gas-impervious refractory composition made from a mixture comprising 65-80 wt.% fused alumina, 2-30 wt.% calcined alumina, 1-10 wt.% binder, 0.5-10 wt.% aluminum metal, up to 15 wt.% zirconia, and less than 3 wt.% silica.

11. The refractory nozzle of any one of the previous claims, further characterized by the nozzle including an inert gas delivery system.

12. The refractory nozzle of claim 11, characterized by the gas delivery system being selected from the group consisting of channels, grooves and devices.

13. The refractory nozzle of any one of the preceding claims, further characterized by a metal housing at least partially encasing the outer surface of the nozzle.

14. The refractory nozzle of any one of the preceding claims, further characterized by the permeable composition extending to the top surface, whereby inert gas can purge the molten metal when pressure of the inert gas exceeds ferrostatic head in the molten metal.